

PMR

BAXTER SITE
INVESTIGATION

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INTRODUCTION

This report identifies the types of chemical residues present in the soils and groundwater of the Baxter property, describes the hydrogeologic setting of the site, and provides a preliminary characterization of the magnitude and distribution of potential contamination on the property. The Baxter property is located on the southeastern shore of Lake Washington, west of the 44th Street overpass to Highway 405, and north of the commercial center of the City of Renton (Figure 1). At the present time, there are no commercial or industrial activities taking place on the property.

Studies conducted for the evaluation of the property can be divided into the following elements:

- A review of geological, hydrological, and other available data pertinent to the property, including interviews with individuals knowledgeable on previous hydrogeologic studies of the area and past industrial activities conducted on the site.
- Drilling, soil sampling, and installation of monitoring wells.
- Hydrologic testing and sampling of water monitoring wells.
- Laboratory analysis of water and soil samples.

This report is organized into the following sections:

1.0 INTRODUCTION

2.0 METHODS: Description of the methods used in conducting the studies outlined above.

3.0 GEOLOGY: Description of the geologic setting of the Baxter property

4.0 HYDROLOGY: Description of the groundwater hydrology of the property

5.0 CHEMICAL RESIDUES:

Identification of the types of chemical residues in the soils and groundwater on the property and preliminary evaluation of the quantities and distribution of these residues.

6.0 REFERENCES

Appendix A: Field Boring Logs

Appendix B: Field Water Sampling Data Sheets and Water Level Data Sheet

Appendix C: Transmissibility Calculations for Selected Wells

Appendix D: Analytical Methods and Results

DATA REVIEW

Prior to initiating field investigations, publications and other data relevant to an understanding of the hydrogeologic conditions on the property were reviewed. Primary sources of information included the library of the Washington State Department of Natural Resources, the University of Washington Library, and CH₂M-Hill Company. A listing of publications relevant to this study is provided in Section 6.0. In addition to the literature review, aerial photographs of the project area taken in 1936, 1941, 1946, and 1960 were examined. Meetings with representatives of J.H. Baxter provided insight to earlier investigations conducted in the area and the nature of the industrial activities that occurred on the property.

BORING AND SOIL SAMPLING

Data from the literature review, aerial photographs, and interviews were used to plan the soil and groundwater field investigations of the property. Four borings were drilled to an average depth of approximately 20 feet below the ground surface (Figure 2) in the area of the wood treating facilities. The borings were limited to a maximum depth of about 20 feet in order to prevent possible transfer of contamination to or from deeper horizons when the borings were converted to water wells. The borings were completed with a truck-mounted B-61 drill equipped with a 6-inch inside diameter (I.D.) hollow stem auger.

The soil sampling program was designed to obtain the maximum information on contamination in the upper 10 feet of the ground. As conditions permitted, samples were collected continuously in each boring to an average depth of 10 feet. Below that depth, the sampling interval was increased to an average of 4 to 5 feet to the bottom of the hole.

Two types of soil samplers were on hand throughout the program: an 18-inch long, 1-3/8-inch I.D. split spoon (ASTM D-1586) and a 3-foot long, 2.8-inch I.D. Shelby tube sampler. Successful recovery is accomplished with the split spoon sampler in granular or mixed soils, while the Shelby tube sampler is more effective in clay or clayey soils. Since good recovery was achieved with the split spoon, it was used throughout the program.

To collect the soil samples, the auger drill was advanced to the desired depth and the sampler was lowered through the center of the hollow stem with connecting rods. The connecting rod/sampler assembly was then driven into the soil with a 140 pound hammer. A record was kept of the number of blows required to drive the sampler.

After being driven into the soil, the sampler was removed, opened, and the soil sample was transferred to sterilized glass jars with teflon lids. These containers were supplied by Laucks Laboratories of Seattle, Washington. As the jars were filled and sealed, they were placed in ice chests at the site. The samples were taken in the chests to the laboratory on a daily basis to minimize excessive dissipation of volatiles prior to laboratory analysis. Each jar was labeled clearly with the boring number, sample number, and name of the attending geologist. In addition, sample depths and identification numbers were recorded on the field log for each boring. To establish the chain of custody, the samples were logged in at the laboratory as they were delivered.

Following removal of the sample, the split spoon was subjected to a three phase cleaning before reassembly to avoid contamination between

samples. All components of the sampler were washed and scrubbed in soap and water. This was followed by a rinse with methyl alcohol and a final wash with triple distilled, deionized water. As a check on the thoroughness of the cleaning procedure, control samples of distilled water run across the cleaned surfaces of the sampler, as well as the distilled water itself, were periodically taken to the laboratory for analysis. These samples were identified as the "W" series.

To prevent the possibility of transfer of contamination from one boring to another, augers and peripheral equipment were steam cleaned and scrubbed between borings. In addition, casings for each well were steam cleaned prior to installation.

During drilling, a field log of each boring was taken by the onsite geologist. A rock/soil description, Unified Soil Classification System field designation, color, texture, moisture, sample number and depth, and standard penetration test (SPT) blow counts were recorded on the logs with depth. These logs are provided in Appendix A. A lithologic sketch log appears in one column using appropriate symbols for sand, clay, and other materials encountered during drilling. Another column on each boring log denotes design placement of slotted screen and blank sections of casing for the well installed in the borings.

WELL INSTALLATION, TESTING, AND SAMPLING

All of the borings were converted to water monitoring wells. These wells were designed to sample groundwater, provide a stationary, surveyed reference for measurement of static water levels, and provide data on aquifer performance.

Four-inch I.D. stainless steel screen and riser pipes were used in the wells and the other well was completed with threaded 4-inch I.D. PVC screen and blank sections. At one location, multiple wells were installed so that separate intervals could be monitored independently

(Figure 2). Well coordinates, ground elevations, and measuring point elevations for the top of each well casing were surveyed in. A summary of the physical specifications for each well including total depth, ground elevation, measuring point elevation, diameter, material for casing and screen, and coordinate location is provided in Table 1.

Each well was installed immediately following auger boring and soil sampling. After the auger drill was advanced to the desired depth, the well casing, including bottom cap, was lowered through the center of the auger and allowed to rest on the bottom of the hole. A sand-gravel pack was poured through the auger as it was removed from the hole to assure a good continuous pack around the annulus of the well screen or slotted section. This sanding process was discontinued one to two feet above the screened section and bentonite pellets followed by a bentonite-cement slurry was then placed in the annulus to provide a seal as a precaution against intercommunication between the surface and screened zones. Finally, a cement cap approximately one foot thick was poured flush with the ground to stabilize the well head. "As built" diagrams for the wells are provided on the log sheets in Appendix A.

Where PVC was used for casing material, threaded sections were used with no glue or adhesives of any kind as a precaution against this source of possible sample contamination. As previously mentioned, both stainless steel and PVC casing sections were thoroughly steam cleaned prior to installation.

Following completion, each well was jetted with air using a PVC pipe set in the casing and a trailer-mounted compressor unit. The jetting was performed to assure satisfactory initial flushing of the sand-gravel pack and to improve the flow of groundwater into the well. Each well was then pumped with an electric pump to remove an equivalent of three well volumes of water. This was done to assure that samples obtained from the

wells were representative of ambient groundwater conditions. If the well was incapable of delivering a satisfactory volume of water to the pump, hand bailing was employed to condition the well.

A detailed record of performance was maintained during the pumping and subsequent recovery period for each well. Prior to pumping, the static water level was measured and referenced to the surveyed measuring point on the top of the casing. The time and depth to water was noted during pumping and the recovery period after pumping was stopped.

All static water level measurements were made with a steel tape accurate to 1/100 foot; recovery data was obtained using an electrical meter sounding device with a tested repeat accuracy equivalent to the steel tape. The use of the electric sounder was necessary because of the rapid changes in water levels observed during the recovery period.

Frequent water samples were taken during the pumping period and tested in the field to determine temperature, pH, and specific conductivity of the water. These measurements were taken with a thermometer, pH meter, and a conductivity-resistivity bridge. A summary of all information obtained during sampling is provided in Appendix B.

Following the pump and recovery testing, a sterilized teflon bailer of suitable diameter was used to bail an additional well volume from each well prior to sampling. Water samples were carefully poured into preconditioned, labeled containers furnished by Laucks Laboratories, Inc. These samples were stored in an ice chest onsite until they could be transported to the laboratory. Chain of custody procedures similar to those described for the soil samples were observed.

The bailer was subjected to the same three phase cleaning procedures as the split spoon between collection of each water sample. To further assure against contamination, new ropes were used on the bailers for each well sampled.

At the conclusion of water sampling, the static water level in each well was measured over a brief period of time using a chalked steel tape referenced to the surveyed measuring point marked at the top of each well casing. In addition, the level of Lake Washington was surveyed in at this time. This information is provided in Appendix B.

Additional water samples were obtained from sumps located beneath the retort along the east side of the tank farm and beneath the cooling tower. Handling of these samples was identical to the water samples obtained from the wells.

LABORATORY ANALYSES

Table 2 lists the various methods used to analyze the soil and water samples and the number of samples analyzed by each method. The soil samples were screened for polycyclic aromatic hydrocarbons (PAH) by absorbance. This method involves methylene chloride extraction, evaporation of the methylene chloride, and re-dissolving the extract with cyclohexane, followed by measurement of the absorbance at 250 nanometers. The absorbance was compared with benzo(a)pyrene standards. A description of the detailed procedure used for the absorption screening is provided in Appendix D. This procedure was compared to the analysis method recommended by the Washington State Department of Ecology (DOE) for six soil samples from the adjacent Port Quendall property. A discussion of the comparison is included in the report on the Port Quendall property (Woodward-Clyde Consultants 1983).

Dioxin concentrations in soil samples were estimated using standard U.S. Environmental Protection Agency (EPA) procedures. A fused silica gas chromatograph (GC) column was used for the analysis followed by an electron capture detector.

The PAH concentration in water samples was determined by the recommended DOE method. This method uses a series of extractions to isolate

PAH compounds followed by evaporation and weighing. The optional analysis step of the DOE procedure entailing the use of high pressure liquid chromatography (HPLC) to separate 2- and 3-ring PAHs from the larger ring PAHs was used followed by the measurement of the absorbance and comparison to benzo(a)pyrene standards. These larger ring compounds are the only PAHs considered in the DOE definition of an extremely hazardous waste on the basis of PAH content.

Volatile aromatics in water samples were determined by use of a purge-and-trap procedure followed by GC analysis. A photoionization detector was used following passage of the volatiles through the GC.

Pentachlorophenol concentrations in water samples were determined by the Sep-Pak method which involves acidification, passage of the water through an activated Sep-Pak, elution of the Sep-Pak, followed by HPLC analysis. A detailed description of this method is provided in Appendix D.

A quality assurance and control program was instituted that involved samples collected mostly from the Port Quendall property. This program is applicable to the laboratory analyses conducted for this study. The program results are contained in Appendix D.

The Baxter property is located on the northern end of a delta/alluvial fan complex which developed at the original mouth of May Creek where it flowed into Lake Washington. The creek has been diverted several times, and since 1969, it has flowed in a south-southwesterly direction across the eastern side of the delta/fan, entering Lake Washington at the southern end of the Barbee Mill property. This property is located at the southern end of the delta/fan.

Prior to 1916, about three quarters of the delta/fan area exposed today was below lake level. In that year, the ship canal was cut between Lake Washington and Union Lake, resulting in the lowering of Lake Washington from 22 feet to 14 feet above sea level (Liesch et al. 1963). This exposed much of the delta, and since that time considerable filling has been done to accommodate use of the property.

The May Creek delta/fan complex consists of sand, clay, silt, gravel, and peat interbeds, that exhibit a highly variable lithology. Source materials for these deposits include drift and till units incised by the creek. The natural sediments of the property are overlain by fill material.

Twelker (1971) indicates that the delta/fan can be divided into at least an upper and lower unit. He has described the upper unit as a loose to medium-dense sand with thin layers of peat and silt. The lower unit consists of dense sand with gravel lenses and no peat. Based on this description, borings conducted for the current study were located in the upper unit of the delta/fan.

It is postulated that the May Creek delta/fan is underlain by the lower clay unit described by Liesch et al. (1963) (Qc1 on Figure 3). Liesch suggests that this unit is relatively widespread in northwestern King County. It outcrops to the north of the Baxter property on Mercer Island and the mainland. The unit underlies the southeastern arm of Lake Washington and Mercer Island, dipping gently westward along both its upper and lower contacts.

The lower clay unit is approximately 50 feet thick and is composed almost entirely of gray, blue, and brown clay and silt. The unit is thick bedded to laminated and was deposited for the most part in standing water, with the clay being locally varved. Wells drilled into the lower clay unit in northwest King County are reported to yield little water. It appears that the unit acts as an aquitard, inhibiting the downward movement of water from younger sediments.

The total thickness of the May Creek delta/fan is not yet known. The delta/fan was not penetrated during the drilling program conducted for this study. A previous exploration program (Twelker 1971) conducted nearby with borings up to 61 feet deep does not appear to have reached the bottom of the delta/fan either since a stratigraphic unit similar to the lower clay unit is not shown on the cross sections generated from that program.

Groundwater hydrology characteristics may vary across the Baxter property in response to the variability in the stratigraphy and lithology of the May Creek delta/fan sediments. However, some general trends in the groundwater regime can be identified.

Recharge of the groundwater aquifer on the property occurs primarily in the upper reaches of the May Creek drainage basin, which covers approximately 8100 acres (CH₂M-Hill 1977). However, some recharge also occurs by infiltration of precipitation that falls directly on the site. The surface of the groundwater table on the property slopes toward the northwest, and varies from a mapped elevation of almost 18 feet at well BAX-1 to about 15 feet at Lake Washington. This results in a groundwater surface gradient of about 36 feet/mile (0.0069 foot/foot) with a total hydraulic head of about 3 feet across the property. Based on an examination and review of the local geology, the stratigraphy exposed in exploration borings, and the study of the depositional environment of the May Creek delta/fan, it is interpreted that groundwater discharge is into the sub-bottom of Lake Washington in the near shore environment.

The groundwater surface is generally uniform across the property. However, the hydraulic gradient decreases slightly toward the eastern portion of the property.

The coefficient of transmissibility, as calculated from pump tests at well BAX-1, illustrates the characteristics of local groundwater flow.

Transmissibility of an aquifer is a measure of the rate of flow of water subject to a unit hydraulic head through a vertical strip of soil one foot high. In general, relatively high values of transmissibility indicate high rates of groundwater movement. The calculated coefficient of transmissibility at well BAX-1 was 276 gallons per day per foot (gpd/ft). Based on estimates of saturated thickness from the log of well BAX-1 and an estimate of representative porosity for the sediments, the velocity of groundwater travel at BAX-1 is about 15 feet/year.

SOILS

Table 3 lists the results of the absorbance screen for PAHs and Figure 2 presents a spatial plot of these data. Polycyclic aromatic hydrocarbons were below the detection limit of 0.001 percent by weight as benzo(a)pyrene (10 ppm) in 15 of 19 soil samples collected onsite. Detectable concentrations of PAHs ranging from 0.002 to 0.004 percent were found in the remaining soil samples. These concentrations are far below the one percent concentration level used by the Washington State Department of Ecology (DOE) to define an "extremely hazardous waste" when the quantity of material exceeds 400 pounds.

Dioxin was not identified in the three soil samples analyzed for this compound (Appendix D). The detection limit used in the dioxin analysis was 0.71 ug/kg (ppb).

WATER

Based on an analysis of inorganic constituents (Appendix D), the groundwater on the property is fresh (i.e., low dissolved solids) and very hard (more than 180 mg/l of CaCO_3). The pH of the groundwater varies from slightly acidic (6.4) to slightly alkaline (7.6).

Table 4 lists the results of the organic analyses of the water samples and Figure 3 provides a spatial plot of these data. Water samples from the retort and cooling tower sumps contained 319 and 163 ug/l, re-

spectively, of PAHs. Four groundwater samples from the Baxter property (samples BAX-1, BAX-1A, BAX-2, and BAX-3) have detectable PAH concentrations that range from only 7 to 43 ug/l. The DOE uses water quality criteria recommended by the EPA in the November 28, 1980 Federal Register for evaluations of potential priority pollutants in water (personal communication, G. Brugger, DOE, August 1983). No freshwater aquatic life or human health criteria are presently recommended by the EPA for PAHs, although toxicity and risk-level data are presented in the Federal Register reference.

Volatile aromatic hydrocarbons were present at slightly above the detection level in two of the four groundwater samples and in none of the sump water samples. Benzene and toluene concentrations were 1.4 and 1.8 ug/l, respectively, in BAX-3. The xylene concentration in the sample from well BAX-1 was 19 ug/l. Pentachlorophenol was present at detectable concentrations in one of three groundwater samples. This compound was present in the sample from Well BAX-1 at a concentration of 6250 ug/l. No criteria have been promulgated by the EPA for volatile aromatic hydrocarbons and pentachlorophenol although toxicity and risk-level data are presented in the Federal Register.

6.0

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Table 1. MONITORING WELL INSTALLATIONS

Well	Total Depth (ft)	Ground Elev. (ft)	M.P. Elev. ^a (ft)	Dia. (in)	Material	Monitored Interval (ft)	North Coordinate	East Coordinate
BAX-1	19.5	20.5	22.11	4	PVC	5-19.5	197,916	1,662,967
BAX-1A	20.0	20.5	21.48	4	Stainless	5-20.0	197,923	1,662,967
BAX-2	21.0	20.2	21.67	4	Stainless	5-20.0	197,868	1,662,787
BAX-3	22.0	18.7	20.26	4	Stainless	7-22.0	198,011	1,662,705

^a M.P. denotes measuring point at top of installed casing used for various hydrologic measurements.

Table 2. ANALYTICAL METHODS USED FOR THE ANALYSIS OF SOIL AND WATER SAMPLES

Parameter	Number of Samples	Method
<u>SOIL</u> ^a		
PAH ^b Screen	19	Absorbance of extract
Dioxin (2,3,7,8,-TCDD)	3	EMSL-LV, No. 2; modified EML-Ci ^c method; EPA Method 613
<u>WATER</u>		
PAHs	6	Appendix G of 173-303 WAC ^d , 3/83
Volatile Aromatics	6	EPA Method 602
Pentachlorophenol	3	Sep-Pak Method
pH	6	EPA Method 150.1
Total Alkalinity	6	EPA Method 310.2
Conductivity	6	EPA Method 120.1
Sodium	6	EPA Method 273.1
Calcium	6	EPA Method 215.1
Magnesium	6	EPA Method 242.1
Potassium	6	EPA Method 258.1
Chloride	6	EPA Method 325.1
Sulfate	6	EPA Method 375.4
Nitrate-Nitrite	6	EPA Method 353.2
Total Phenols	3	EPA Method 420.2

^a Boring and trench soil samples.

^b Polycyclic aromatic hydrocarbons.

^c U.S. EPA Environmental Measurement System Lab. - Cincinnati.

^d Washington State Administrative Code.

Table 3. ANALYTICAL RESULTS FOR POLYCYCLIC AROMATIC HYDROCARBON (PAH)
SCREENING OF SOIL SAMPLES^a

Boring	Sample	Depth (feet)	PAH Concentration ^b
BAX-1	D-1	1.5-3	L/0.001
	D-2	3-4.5	0.002
	D-3	4.5-6	L/0.001
	D-4	6-7.5	L/0.001
	D-5	7.5-9	L/0.001
	D-6	12.5-14.4	L/0.001
	D-7	18-19.5	L/0.001
BAX-2	D-1	4.5-6	0.003
	D-2	6-7.5	L/0.001
	D-3	7.5-9	L/0.001
	D-4	9-10.5	L/0.001
	D-5	14.4-15.9	L/0.001
	D-6	19.5-21	L/0.001
BAX-3	D-1	3-4.5	0.004
	D-2	4.5-6	L/0.001
	D-3	6-7.5	L/0.001
	D-4	7.5-9	0.001
	D-5	12.9-14.4	L/0.001
	D-6	18-19.5	L/0.001

^a Screening by measurement of absorbance of extract and comparison to benzo(a)pyrene standards.

^b % PAH by weight of soil as benzo(a)pyrene; L/# = Below detection level of #.

Table 4. CONCENTRATIONS OF SELECTED ORGANIC CONSTITUTENTS IN WATER
SAMPLES^a

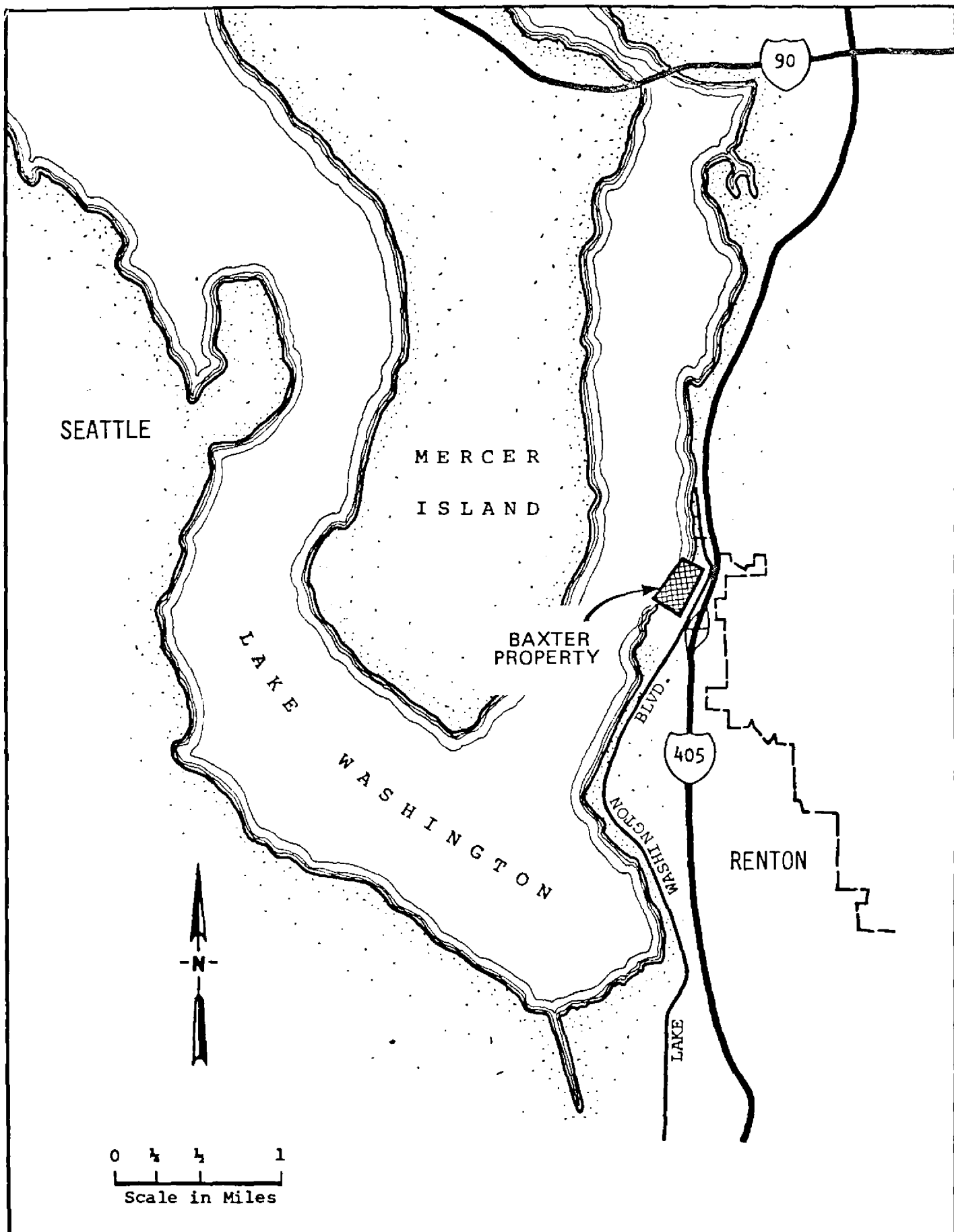
Parameter	Sample Concentration ^b (g/l)					
	Cooling Tower Sump	Retort Sump	BAX-1	BAX-1A	BAX-2	BAX-3
Depth Screened (Feet)	--	--	5-19.5	5-20.0	5-20	7-22
PAH ^c	319	163	25.3	12.2	7.0	42.5
Benzene	L/1.0	L/1.0	L/1.0	L/1.0	L/1.0	1/4
Toluene	L/1.0	L/1.0	1.1	L/1.0	L/1.0	L/1.0
Xylene	L/1.0	L/1.0	19.0	L/1.0	L/1.0	1.8
Penta- chloro- phenol	--	--	6250	L/10.0	L/1.0	--

^a The sample name reflects the well from which the sample was collected.

^b L/# = Below detection level of #.

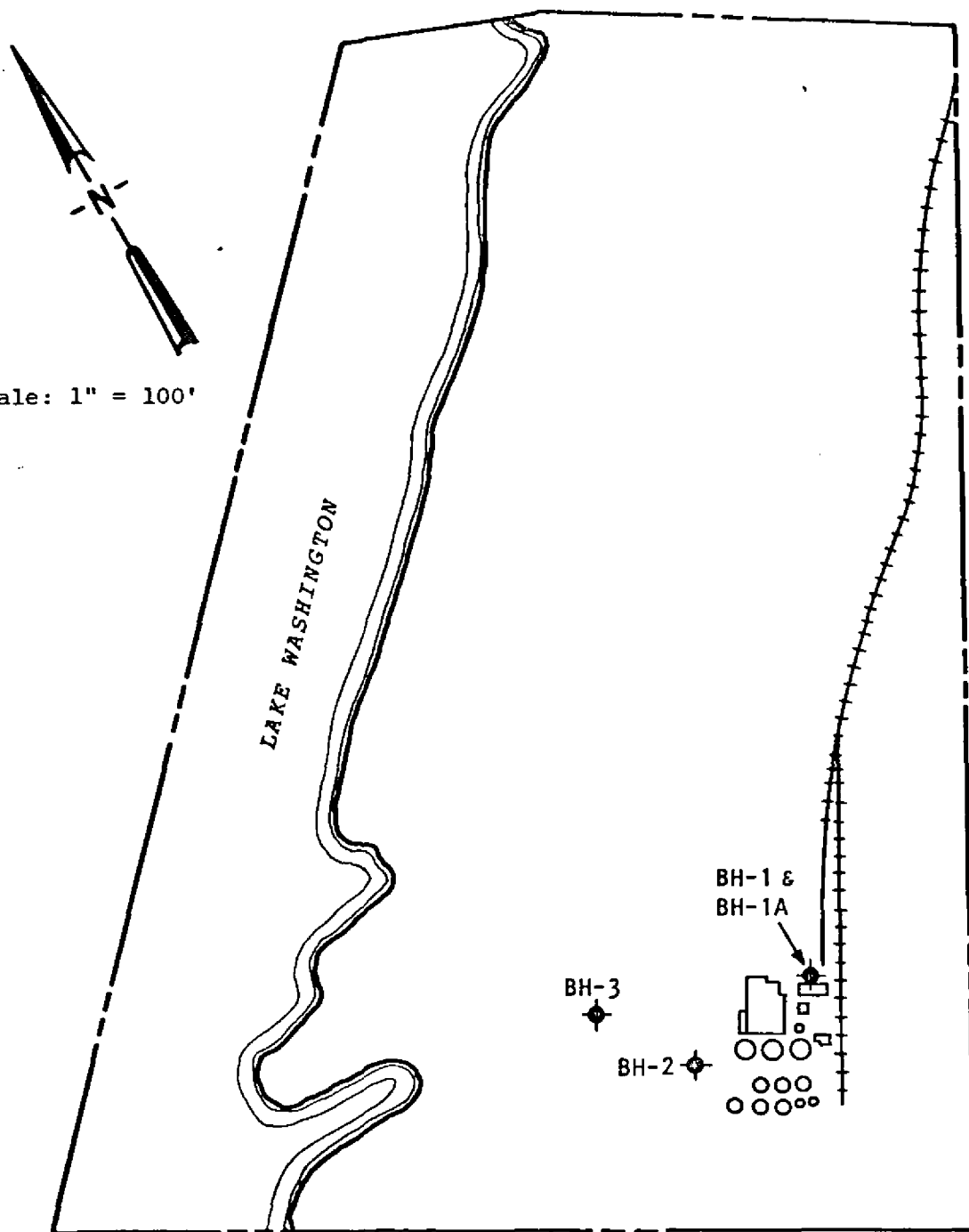
^c By Washington State Dept. of Ecology Method.

NOTE: Refer to Table 2 for Analytical Method.



Project No. 90033A	BAXTER PROPERTY Renton, Washington	LOCATION OF BAXTER PROPERTY	Figure 1
Woodward-Clyde Consultants			

Scale: 1" = 100'



BORING	NORTH	EAST	ELEVATION (GL.)	HIGHEST CONCENTRATION OBSERVED
BH-1	197,916	1,662,967	20.5 ft.	(PAH-0.002%) PAH(5-19.5')-25.3 ppb
BH-1A	197,923	1,662,967	20.5 ft.	(PAH-0.002%) PAH(5-20')-12.2 ppb
BH-2	197,868	1,662,787	20.2 ft.	(PAH-0.003%) PAH(5-20')-7.0 ppb
BH-3	198,011	1,662,705	18.7 ft.	(PAH-0.004%) PAH(7-22')-42.5 ppb

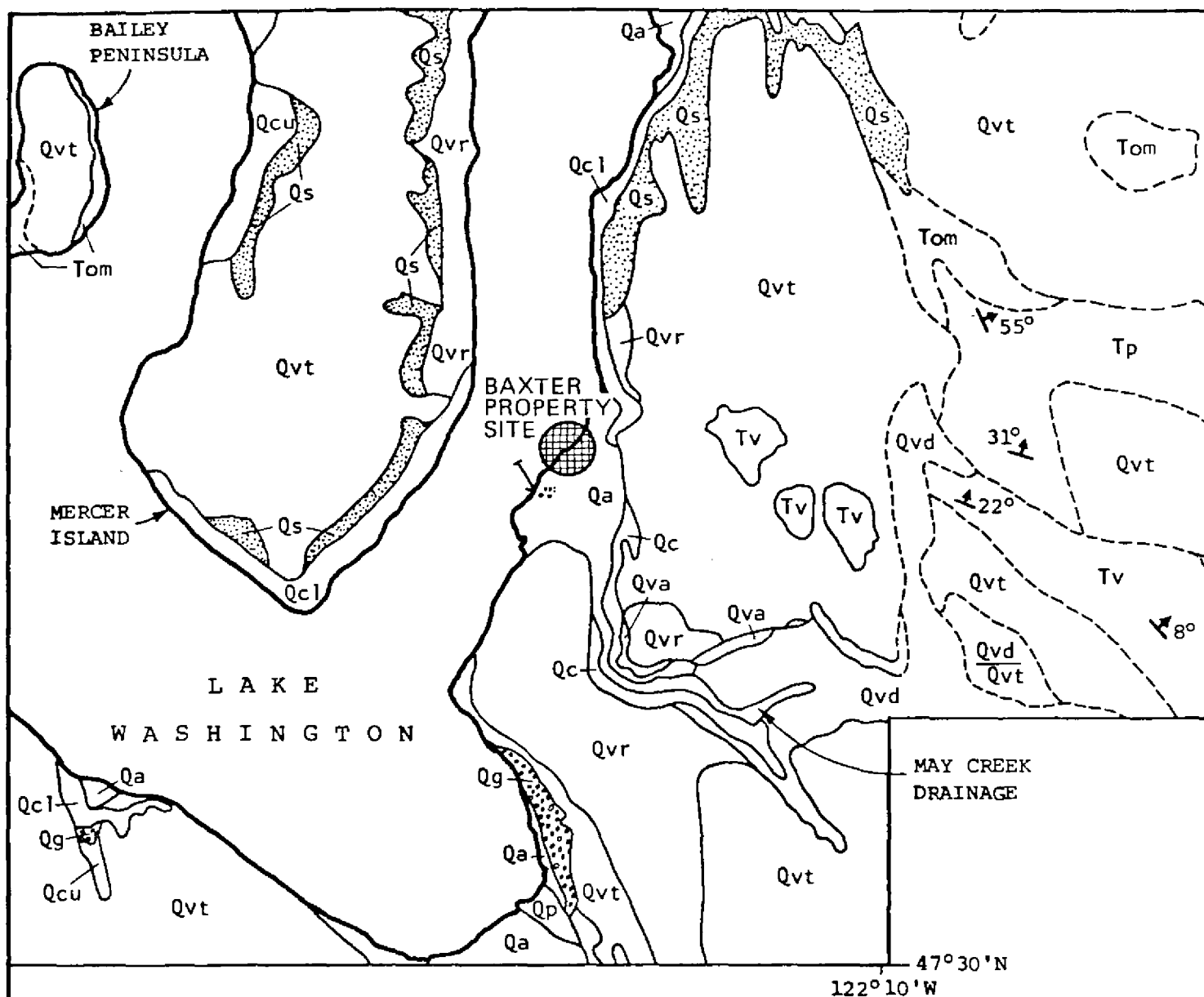
Project No.
90033A

BAXTER PROPERTY
Renton, Washington

Woodward-Clyde Consultants

BORING LOCATIONS

Figure 2



EXPLANATION

RECENT	Qa	SEDIMENTARY DEPOSITS, UNDIFFERENTIATED	Qp	PEAT
	Qvr	RECESSIONAL STRATIFIED DRIFT	Qvd	DELTA GRAVEL
PLEISTOCENE	Qvt	TILL		
	Qva	ADVANCE STRATIFIED DRIFT		
	Qs	UNNAMED SAND		
	Qcu	UPPER CLAY UNIT		
	Qg	UNNAMED GRAVEL		
OOLIGOCENE-MIOCENE	Qcl	LOWER CLAY UNIT	Qc	CLAY, UNDIFFERENTIATED
	Tom	MARINE SEDIMENTARY ROCKS		
EOCENE	Tp	PUGET GROUP		
	Tv	VOLCANIC ROCKS		

22° STRIKE & DIP OF CONSOLIDATED BEDS

Map after Liesch, Price, & Walters

Scale: 1:48,000

Project No.
90033A

BAXTER PROPERTY
Renton, Washington

SURFICIAL GEOLOGY MAP

Figure 3

Woodward-Clyde Consultants

APPENDIX A

BORING AND WATER WELL LOGS

Project: BAXTER PROPERTY Renton, Washington				Log of Boring No. 1			
Date Drilled: May 20, 1983				Remarks:			
Type of Boring: 6" Hollow Stem Auger							
Hammer Weight:							

Depth, Ft.	Samples	Blows/Ft.	PAH concentration (%)	MATERIAL DESCRIPTION	LITHOLOGY	WELL DETAIL
Surface Elevation:						
				FILL Sandy gravel		4" I.D. PVC blank Sand Pack 4" I.D. PVC slotted
1	21	<		CLAYEY SILT (MH) Olive-brown, damp, highly plastic		
2	9	0.002		SANDY SILT (ML) Gray, some clay, slight odor, occasional peat and organic lenses		
3	2	<				
4	6	<				
5	10	<		SILTY SAND (SM) Gray, medium to coarse, 20% silt		
6	5	<		} Peat CLAYEY SILT (MH) Black, damp, some peat		
7	8	<		SILTY SAND (SM) Olive-gray, medium to coarse, occasional clay/silt interbeds		
20				BOTTOM OF BORING @ 19.5'		

Proj. No. 90033A	Woodward-Clyde Consultants	Appendix A-1
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Project:		BAXTER PROPERTY Renton, Washington		Log of Boring No. 1A		
Date Drilled:		June 1, 1983		Remarks:		
Type of Boring:		6" Hollow Stem Auger				
Hammer Weight:						
Depth, Ft.	Samples	Blows/Ft.	PAH concentration (%)	MATERIAL DESCRIPTION	LITHOLOGY	WELL DETAIL
Surface Elevation:						
5				MONITORING WELL 1A "AS BUILT" DIAGRAM No lithologic log or sampling Installation is monitoring well 7.5 feet north of Boring 1	CEMENT BENTONITE PELLETS 4" I.D. STAINLESS STEEL RISER SAND PACK 4" I.D. STAINLESS STEEL (304) SLOTTED/SCREEN	
10						
15						
20				BOTTOM OF BORING @ 20'		CAP
Proj. No. 90033A		Woodward-Clyde Consultants			Appendix A-2	

Project: BAXTER PROPERTY Renton, Washington				Log of Boring No. 3	
Date Drilled: June 2, 1983				Remarks: _____	
Type of Boring: 6" Hollow Stem Auger				_____	
Hammer Weight: _____				_____	

Depth, Ft.	Samples	Blows/Ft.	PAH concentration (%)	MATERIAL DESCRIPTION	LITHOLOGY	WELL DETAIL
Surface Elevation: _____						
				FILL Gravels with sand, 1" minus subrounded to angular	Cement	
1	3	0.004		SILTY SAND (SM) Dark greenish gray, some clay, occasional thin (0.1' average) peat lenses, no odor Peat Peat	Bentonite Pellets 4" I.D. stainless riser	4" I.D. stainless well screen
5	2	6	<			
3	2	<				
4	2	0.002				
10				SILTY CLAY (CL-CH) Olive-gray, some (5%+) sand, occasional thin (0.1') peat lenses Peat	Sand Pack	
5	3	<				
15				SILTY SAND / CLAYEY SAND (SM-SP) Gray, medium to fine, occasional thin peat lenses Peat	Cap	
6	4	<				
20				BOTTOM OF BORING @ 22'		

Proj. No. 90033A	Woodward-Clyde Consultants	Appendix A-4
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APPENDIX B

FIELD WATER SAMPLING AND WATER LEVEL DATA SHEETS

FIELD WATER SAMPLING DATA SHEET
 Port Quendall- Project 90029 A
 Don W. Spencer- Project Geologist

WELL	DATE	TIME	VOLUME OF DISCHARGE	DEPTH TO WATER	TEMP (°C)	pH	Cs	SAMPLE #	REMARKS
BAX-1	6-15-83	14:51	—	4.60	15.0	6.6	601umbe	1	START Pump
"	"	14:59	13.75	6.07	16.0	6.0	577 "	2	Pumping
"	"	15:08	27.5	6.55	15.0	6.3	568 "	3	" "
"	"	15:17	41.25	6.74	15.0	6.1	563 "	4	" "
"	"	15:25	55.0	6.84	14.0	6.2	553 "	5	" "
"	"	15:34	68.7	6.91	14.0	6.3	561 "	6	" "
"	"	15:43	82.5	6.99	15.0	6.2	564 "	7	" "
"	"	15:53	96.3	7.05	14.5	6.2	564 "	8	" "
"	"	16:01	110.0	7.08	14.5	6.2	415 "	9	" "
"	"	16:09	123.7	7.13	14.5	6.2	564 "	10	" "
"	"	16:18	137.5	7.17	14.0	6.0	562 "	11	" "
"	"	16:27	151.2	7.20	14.0	6.1	563 "	12	" "
"	"	16:36	165.0	7.24	14.0	6.1	565 "	13	" "
"	"	16:39	—	—	—	—	—		STOP Pump
"	"	16:40	—	7.35	—	—	—	—	Recovery
"	"	16:40:30	—	6.83	—	—	—	—	" "
"	"	16:41	—	6.67	—	—	—	—	" "
"	"	16:41:30	—	6.47	—	—	—	—	" "
"	"	16:42	—	6.33	—	—	—	—	" "
"	"	16:42:30	—	6.15	—	—	—	—	" "
"	"	16:43	—	6.04	—	—	—	—	" "
"	"	16:44	—	5.89	—	—	—	—	" "
"	"	16:45	—	5.78	—	—	—	—	" "
"	"	17:00	—	—	—	—	—	—	Begin RAL
"	"	17:10	—	—	—	—	—	—	End RAL

FIELD WATER SAMPLING DATA SHEET
 Port Quendall- Project 90029 A
 Don W. Spencer- Project Geologist

WELL	DATE	TIME	VOLUME OF DISCHARGE	DEPTH TO WATER	TEMP (°C)	pH	Cs	SAMPLE #	REMARKS
BAY 1A	6-16-83	12:26	—	3.91	15	5.5	479 unho	1	START PUMP
"	"	12:45	13.75	4.66	16.5	5.7	516 "	2	Pumping
"	"	12:57	27.5	5.12	15.12	5.7	496 "	3	" "
"	"	13:09	41.25	5.17	15.0	5.9	496 "	4	" "
"	"	13:15	55	5.84	15.0	5.8	488 "	5	" "
"	"	13:22	68.7	5.9	15.0	5.8	427 "	6	" "
"	"	13:33	82.5	6.06	15.0	5.8	484 "	7	" "
"	"	13:40	96.3	6.35	15.0	5.7	383 "	8	" "
"	"	13:46	110.0	6.40	14.0	5.7	385 "	9	" "
"	"	13:53	123.7	6.45	15.0	5.8	482 "	10	" "
"	"	14:02	137.5	6.48	14.0	5.8	485 "	11	" "
"	"	14:11	151.2	6.59	14.0	5.8	489 "	12	" "
"	"	14:16	165.0	6.60	14.0	5.8	487 "	13	" "
"	"	14:18	—	6.60	—	—	—	—	STOP PUMP
"	"	14:18:30	—	5.76	—	—	—	—	Recovery
"	"	14:19	—	5.39	—	—	—	—	" "
"	"	14:19:30	—	5.17	—	—	—	—	" "
"	"	14:20	—	5.06	—	—	—	—	" "
"	"	14:21	—	4.92	—	—	—	—	" "
"	"	14:22	—	4.84	—	—	—	—	" "
"	"	14:23	—	4.79	—	—	—	—	" "
"	"	14:24	—	4.73	—	—	—	—	" "
"	"	14:25	—	4.70	—	—	—	—	" "
"	"	14:30	—	—	—	—	—	—	BEGIN HAND BAILING
"	"	14:40	—	—	—	—	—	—	END HAND BAILING

FIELD WATER SAMPLING DATA SHEET
 Port Quendall- Project 90029 A
 Don W. Spencer- Project Geologist

WELL	DATE	TIME	VOLUME OF DISCHARGE	DEPTH TO WATER	TEMP (°C)	pH	Cs	SAMPLE #	REMARKS
BAX-2	6-21-83	11:06	—	4.20	16	5.5	434umhos	1	Begin Railing
"	"	11:25	—	16.61	—	—	—	—	End Railing
"	"	11:36	—	16.58	—	—	—	—	Recovery
"	"	11:37	—	16.51	—	—	—	—	" "
"	"	11:42	—	16.30	—	—	—	—	" "
"	"	11:50	—	15.98	—	—	—	—	" "
"	"	12:00	—	15.59	—	—	—	—	" "
"	"	12:10	—	15.22	—	—	—	—	" "
"	"	12:20	—	14.84	—	—	—	—	" "
"	"	12:30	—	14.48	—	—	—	—	" "
"	"	12:55	—	13.61	—	—	—	—	" "
"	"	13:23	—	12.68	—	—	—	—	" "
"	"	14:05	—	11.31	—	—	—	—	" "
"	"	15:20	—	9.12	—	—	—	—	" "
*NOTE WELL WAS PUMPED ON 6-8-83, & low yield was noted, so sampling was postponed. On 6-21-83, BAX-2 was Railed & sampled & Recovery Data (ABOVE) WAS OBTAINED.									
During Drilling, the hole was enlarged during redrilling to achieve Desired completion Depth - A large quantity of gravel was used in packing. Poor well sand production may be the result of low permeability due to abundant peat on Pack Problems.									

Don W. Spencer- Project Geologist

[illegible]

Don W. Spencer- Project Geologist

WELL	DATE	TIME	VOLUME OF DISCHARGE	DEPTH TO WATER	TEMP (°C)	pH	Cs	SAMPLE #	REMARKS
*	6-21-83	15:10	—	—	21	6.3	250 _u -lbs	1	* sump
<p>* Sample taken from sump to west of Base of remains of cooling tower on Barker property.</p> <p>(1) <i>[Signature]</i></p>									

FIELD WATER SAMPLING DATA SHEET
Port Quendall- Project 90029 A
Don W. Spencer- Project Geologist

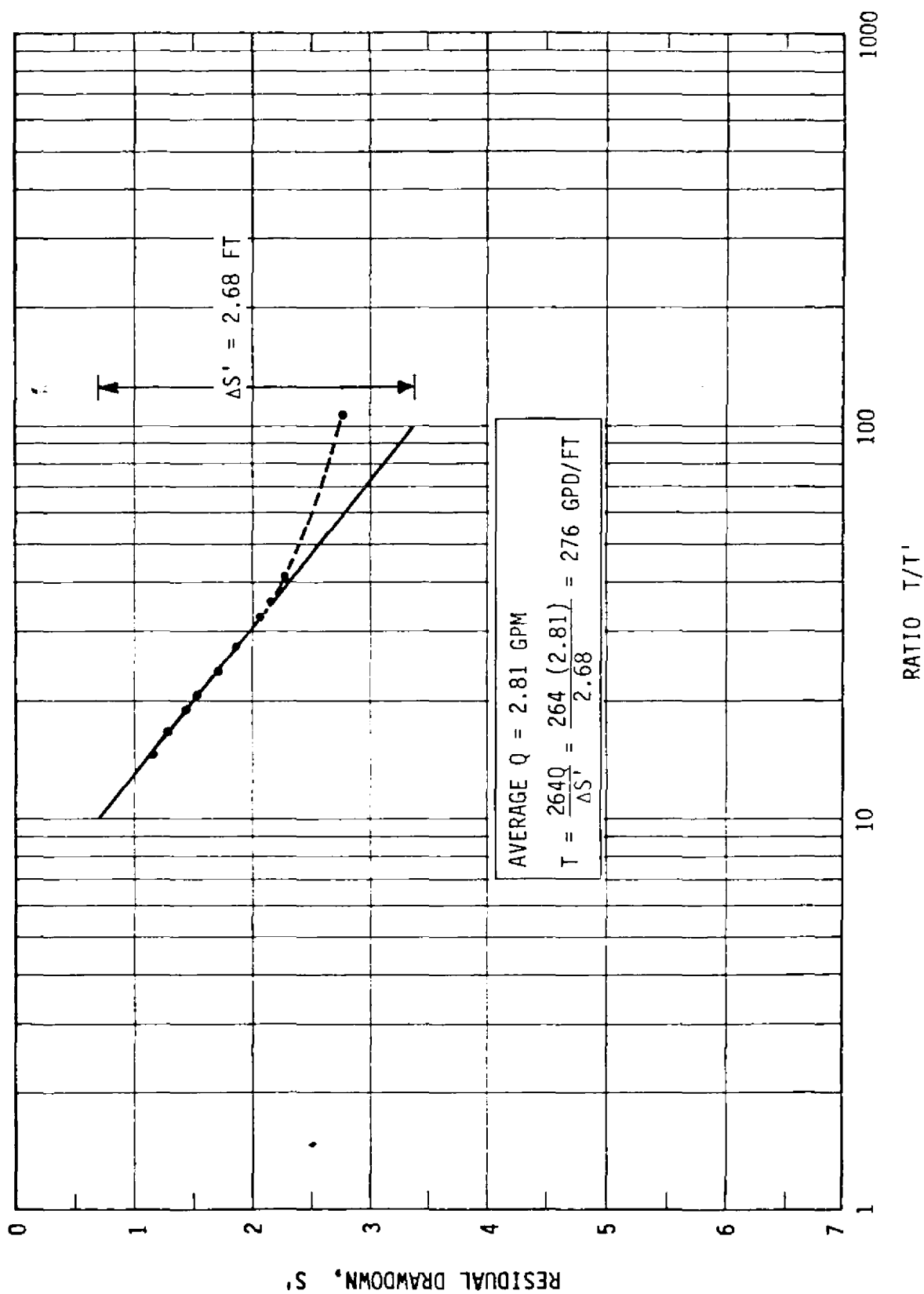
WELL	DATE	TIME	VOLUME OF DISCHARGE	DEPTH TO WATER	TEMP (°C)	pH	Co	SAMPLE #	REMARKS
*	6-21-83	13:20	—	—	18	7.2	215unhes	1	sump
<p>* Sample taken from sump below existing Retort/ Pressure vessel on Baxton property using vacuum flask apparatus.</p> <p><i>(D. Spencer)</i></p>									

WATER LEVEL DATA SHEET

WELL	DATE	TIME	MEASURING POINT (MP)	MP ELEVATION (FT)	DEPTH TO WATER (FT)	STATIC WATER ELEVATION (FT)
BAX-1	6-27-83	13:50	top of casing	22.11	4.59	17.52
BAX-1A	6-27-83	13:53	top of casing	21:48	3.92	17.56
BAX-2	6-27-83	13:36	top of casing	21.67	4.22	17.45
BAX-3	6-27-83	13:42	top of casing	20.26	3.50	16.76
Lake	6-27-83	11:00	Pile cap	17.82	2.64	15.18

APPENDIX C

TRANSMISSIBILITY CALCULATIONS FOR SELECTED WELLS



Project No. 90033A	BAXTER PROPERTY Renton, Washington	DRAWDOWN CURVE AND TRANSMISSIVITY CALCULATION FOR BORING 1A	Appendix C-1
Woodward-Clyde Consultants			

APPENDIX D

ANALYTICAL METHODS AND RESULTS

APPENDIX D-1
DESCRIPTION OF THE ANALYTICAL
METHODS FOR THE SOIL PAH SCREEN
AND PENTACHLOROPHENOL ANALYSIS OF
WATER

ABSORBANCE SCREEN ON SOILS

1. Weigh 1 +/- .05 g soil to a 250 ml beaker.
2. Add 10 ml DIW and adjust pH to 11 or greater.
3. Add 60 ml methylene chloride, extract 2 minutes with sonic probe.
4. Add sufficient anhydrous sodium sulfate to absorb all water; sonify an additional 30 sec.
5. Filter the extract. Rinse the retained material several times with MeCl_2 .
6. Using the steam bath and a nitrogen stream, blow down the extracts.
7. Add 10 ml cyclohexane to the extracted material; swirl to dissolve.
8. Transfer the contents of the beaker to a culture tube with teflon lined lid.
9. Compare spectrophotometrically against a benzo(a)pyrene standard at 250 nm as follows:

<u>B(a)P conc., ug/ml</u>	<u>equivalent soil %</u>
0	0
1	.001
2	.002
5	.005
10	.010

10. Dilute the extracts as necessary to remain within the calibration curve.

PENTACHLOROPHENOL

(Sep-Pak Method)

1. Sep-Pak extraction.

- a. Take 250 ml sample to 400 ml beaker.
- b. Acidity with 5 ml conc. H_2SO_4 .
- c. Pass through an activated Sep-Pak.
- d. Elute from Sep-Pak with 1.5 ml CH_3CN .
- e. Extract is now ready for analysis.

2. HPLC Analysis.

a. Instrument conditions

Wavelength = 254 nm

Mobile phase = 60% CH_3CN /40% H_2O + 0.1% HOAc

Flow = 1 ml/min

Chart = 0.1 in/min

injection = 25 ul

AFS = 0.01 AU

Column - Zorbax C18, 5um

- b. Use standards of about 15, 7.5 ppm. This should give a detection limit of about 2 ug/L.

APPENDIX D-2

QUALITY ASSURANCE PROGRAM RESULTS

Note: Most of the quality assurance data is for offsite samples
collected during the same time period as onsite samples

QUALITY ASSURANCE REPLICATE ANALYSES



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Replicate Quality Control Report

<u>Sample No.</u>	<u>Analyte</u>	<u>Replicate 1</u>	<u>Replicate 2</u>	<u>Relative Error, %</u>	<u>Control Limit</u>
<u>parts per million (mg/L)</u>					
155	Sodium	30.	32.	6.7	**
155	Potassium	22.	22.	0.	**
157	Sodium	25.	25.	0.	**
157	Potassium	13.	13.	0.	**
155	Sulfate	4.	3.	(1)	**
157	Calcium	38.	38.	0.	**
157	Magnesium	5.4	5.4	0.	**
161	Chloride	8.	8.	0.	**
167	Chloride	42.	43.	2.4	**
154	Nitrate	L/0.05	L/0.05	(0)	**
154	Alkalinity	280.	280.	0.	**
158	Nitrate	0.10	0.10	(0)	**
155	Calcium	64.	62.	3.1	**
155	Magnesium	28.	29.	3.6	**

parts per billion (ug/L)

149	2,4,6-trichlorophenol	3.46	21.7	84.*	**
149	pentachlorophenol	L/10.	L/10.	0.	0-3
149	benzo(k)fluoranthene	5.7	5.78	1.4	**
149	Total PNAs	5.7	6.24	9.5	**

The control limit is a statistically derived measure of the level of confidence in the measurement. These established control limits determine the range within which the analytical value will fall 95% of the time.

*Insufficient sample to repeat analysis. Duplicate analysis indicates a possible matrix problem.

**No control limits yet established.

Parentheses () indicate absolute, not relative, error.



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Replicate Quality Control Report

%, by weight

<u>Sample No.</u>	<u>Analyte</u>	<u>Replicate 1</u>	<u>Replicate 2</u>	<u>Relative Error, %</u>
1	Fluor. Screen	0.005	0.015	(0.010)
15	"	L/0.001	L/0.001	(0)
30	"	0.004	0.002	(0.002)
45	"	0.081	0.058	28.
60	"	0.007	0.007	(0)
75	"	0.94	0.017	98.
90	"	1.0	0.90	10.
105	"	L/0.001	0.002	(0.002)
120	"	0.003	L/0.001	(0.003)
130	"	0.008	0.082	(0.074)
147	"	1.7	1.5	11.8

Comment

No control limits have yet been established. Nevertheless, one would expect a high variability in this determination due to the heterogeneous nature of soils and the fact that only 1-gram portions are used for the analysis.

Parentheses () indicate absolute, not relative, error.



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QUALITY ASSURANCE SPIKING STUDY RESULTS
FOR INORGANIC PARAMETERS IN WATER SAMPLES

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Spike Quality Control Report

parts per million (mg/L)

<u>Sample No.</u>	<u>Analyte</u>	<u>Sample Found</u>	<u>Spike Level</u>	<u>Spike Found</u>	<u>% Recovery</u>
155	Sodium	30.	25.	55.	100.
155	Potassium	22.	25.	50.	112.
157	Sodium	25.	25.	50.	100.
157	Potassium	13.	25.	40.	108.
157	Calcium	38.	25.	60.	88.
157	Magnesium	5.4	25.	31.	102.
161	Chloride	8.	36.	43.	97.
154	Nitrate	L/0.05	0.1	0.092	92.
158	Nitrate	0.10	0.10	0.19	90.
155	Calcium	64.	25.	84.	80.
155	Magnesium	28.	25.	54.	104.
162	Sulfate	22.	20.	45.	115.



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QUALITY ASSURANCE SPIKING STUDY RESULTS
FOR ORGANIC COMPOUNDS IN SOIL AND WATER

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Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

parts per million (mg/kg)

<u>Sample No.</u>	<u>Surrogate Compound</u>	<u>Spike Level</u>	<u>Spike Found</u>	<u>% Recovery</u>	<u>Control Limit</u>
Blank	1,2,3,4-TCDD	0.006	0.0045	75	18-128
106	1,2,3,4-TCDD	0.015	0.013	86.6	18-128
107	1,2,3,4-TCDD	0.0099	0.0097	98.0	18-128
111	1,2,3,4-TCDD	0.0066	0.0081	123.	18-128



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LABORATORY NO 81030-c

Surrogate Recovery Quality Control Report

parts per billion (ug/L)

<u>Sample No.</u>	<u>Surrogate Compound</u>	<u>Spike Level</u>	<u>Spike Found</u>	<u>% Recovery</u>	<u>Control Limit</u>
153	2,4,6-trichlorophenol	100.0	77.3	77.3	63-119
154	"	102.6	37.9	36.9**	"
159	"	105.3	84.9	80.6	"
162	"	100.0	67.2	67.2	"
Blank	"	100.0	97.5	97.5	"
150 spike	"	119.0	88.0	73.9	"
149 dup	"	115.6	21.7	18.8**	"

*Matrix interference.

**Insufficient sample to repeat analysis.



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Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

parts per billion (ug/L)

<u>Sample No.</u>	<u>Surrogate Compound</u>	<u>Spike Level</u>	<u>Spike Found</u>	<u>% Recovery</u>	<u>Control Limit</u>
148	benzo(k)fluoranthene	5.000	3.57	71.4	63-119
149	"	5.000	5.7	114.	"
150	"	5.000	3.00	60.0**	"
151	"	5.000	5.150	103.	"
152	"	5.000	4.57	91.4	"
153	"	5.000	100.	2000.*	"
154	"	5.123	4.99	97.4	"
155	"	5.076	5.18	102.	"
156	"	5.025	89.9	1790.*	"
157	"	5.051	115.	2280.*	"
158	"	5.181	490.	9460.*	"
159	"	5.263	6.47	123.*	"
160	"	5.435	21.9	404.*	"
161	"	5.181	3.83	74.0	"
162	"	5.000	4.02	80.4	"
163	"	5.000	3.84	76.8	"
164	"	5.000	3.79	75.8	"
167	"	5.181	4.87	94.	"
Blank	"	5.000	4.44	88.8	"
149 dup	"	5.780	4.52	78.2	"
148	2,4,6-trichloropheno	100.0	84.0	84.0	"
149	"	100.0	3.46	3.5**	"
150	"	100.0	73.9	73.9	"



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PAH CONCENTRATIONS IN SOIL
DETERMINED BY BOTH THE
ABSORPTION SCREEN AND WASHINGTON
STATE DEPT. OF ECOLOGY METHODS

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CLIENT Woodward-Clyde
100 Pringle Ave.
Walnut Creek, CA 94956

LABORATORY NO. 81030-a

DATE June 22, 1983

Note on Fluorescence Screen. We were unable to visually compare sample extracts with benzo(a)pyrene standards due to differences in fluorescent color. However, the absorbance of the extracts was determined at 250 nm and compared to a B(a)P curve. The results of this determination are attached.



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LABORATORY NO. 81030-a

	<u>7</u>	<u>24</u>	<u>58</u>	<u>69</u>	<u>76</u>	<u>102</u>
Gravimetric Polycyclic Aromatic Hydrocarbons, per Washington State DOE WAC 173-302, % by weight, as received basis*	0.061	0.057	0.018	0.460	0.026	0.064
Fluorescence Screen, % as benzo(a)pyrene	0.03	0.002	0.01	0.44	0.01	0.002



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APPENDIX D-3

SOIL SAMPLE ANALYSIS RESULTS

Note: Data for samples collected offsite have been deleted from the laboratory data sheets in this section.

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LABORATORY NO. 81030-d

	114)	BAX-3	D-1	D. Spencer	6/2
	115)	BAX-3	D-2	D. Spencer	6/2
	116)	BAX-3	D-3	D. Spencer	6/2
	117)	BAX-3	D-4	D. Spencer	6/2
	118)	BAX-3	D-5	D. Spencer	6/2
	119)	BAX-3	D-6	D. Spencer	6/2
	120)	BAX-2	D-1	D. Spencer	6/2
	121)	BAX-2	D-2	D. Spencer	6/2
	122)	BAX-2	D-3	D. Spencer	6/2
	124)	BAX-2	D-4	D. Spencer	6/2
	126)	BAX-2	D-5	D. Spencer	6/2
	127)	BAX-2	D-6	D. Spencer	6/2
BAX-1	105)	BH-17	D-1	D. Spencer	5/20
	106)	BH-17	D-2	D. Spencer	5/20
	107)	BH-17	D-3	D. Spencer	5/20
	108)	BH-17	D-4	D. Spencer	5/20
	109)	BH-17	D-5	D. Spencer	5/20
	110)	BH-17	D-6	D. Spencer	5/20
	111)	BH-17	D-7	D. Spencer	5/20



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PAGE NO. 6

Woodward Clyde Consultants

LABORATORY NO. 81030-d

Fluorescence Screen, % as benzo(a)pyrene

								<u>105</u>	<u>106</u>
								/0.001	0.002
<u>107</u>	<u>108</u>	<u>109</u>	<u>110</u>	<u>111</u>	<u>114</u>	<u>115</u>	<u>116</u>	<u>117</u>	<u>118</u>
L/0.001	L/0.001	L/0.001	L/0.001	L/0.001	0.004	L/0.001	L/0.001	0.002	L/0.001
<u>119</u>	<u>120</u>	<u>121</u>	<u>122</u>	<u>124</u>	<u>126</u>	<u>127</u>			
L/0.001	0.003	L/0.001	L/0.001	L/0.001	L/0.001	L/0.001			

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CLIENT Woodward Clyde Consultants
100 Pringle Avenue
Walnut Creek, CA 94956

LABORATORY NO 81030-b

DATE June 23, 1983

REPORT ON SOIL

SAMPLE IDENTIFICATION

Marked: (106) BH-17 D-2 D. Spencer 5/20
BAX-1 { (107) BH-17 D-3 D. Spencer 5/20
(111) BH-17 D-7 D. Spencer 5/20

TESTS PERFORMED AND RESULTS

parts per billion (ug/kg)

2,3,7,8-TCDD

<u>106</u>	<u>107</u>	<u>111</u>
L/0.71	L/0.71	L/0.71

Key

L/ indicates "less than"

Respectfully submitted,

Laucks Testing Laboratories, Inc.


Mike Nelson

JMO:bg



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APPENDIX D-4
WATER SAMPLE ANALYSIS RESULTS

Note: Data for samples collected offsite have been deleted from the laboratory data sheets in this section.

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Certificate

CLIENT Woodward Clyde Consultants
c/o Don Spencer
2110 E. 10th Street
The Dalles, OR 97058

LABORATORY NO. 81030-c

DATE July 27, 1983

REPORT ON WATER

SAMPLE
IDENTIFICATION

Marked as shown below:

TESTS PERFORMED
AND RESULTS:

148)
149)
150) BAX I
151)
152)
153)
154) BAX1A
155) BAX3
156)
157)
158)
159)
160)
161)
162) BAX2 6/21 D. Spencer
163) Cooling Tower Sump 6/21 D. Spencer
164) Retat Sump

glass electrode at 25°C

	<u>148</u>	<u>149</u>	<u>150</u>	<u>151</u>	<u>152</u>	<u>153</u>
pH			6.4			
	<u>154</u>	<u>155</u>	<u>156</u>	<u>157</u>	<u>158</u>	<u>159</u>
pH	6.6	6.5				
	<u>160</u>	<u>161</u>	<u>162</u>	<u>163</u>	<u>164</u>	<u>167</u>
pH			7.4	7.3	7.6	



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PAGE NO. 2

Woodward Clyde Consultants

LABORATORY NO. 81030-c

micromhos/cm at 25°C

	<u>148</u>	<u>149</u>	<u>150</u>	<u>151</u>	<u>152</u>	<u>153</u>
Specific Conductivity			750.			
	<u>154</u>	<u>155</u>	<u>156</u>	<u>157</u>	<u>158</u>	<u>159</u>
Specific Conductivity	590.	570.				
	<u>160</u>	<u>161</u>	<u>162</u>	<u>163</u>	<u>164</u>	<u>167</u>
Specific Conductivity			460.	230.	200.	

parts per million (mg/L)

	<u>148</u>	<u>149</u>	<u>150</u>	<u>151</u>	<u>152</u>	<u>153</u>
Total Alkalinity as CaCO ₃			350.			
Sodium			87.			
Calcium			66.			
Magnesium			38.			
Potassium			8.1			
Chloride			39.			
Sulfate as SO ₄			L/1.			
Nitrate + Nitrite			0.08			
Total Phenol			0.14			
	<u>154</u>	<u>155</u>	<u>156</u>	<u>157</u>	<u>158</u>	<u>159</u>
Total Alkalinity as CaCO ₃	280.	280.				
Sodium	67.	30.				
Calcium	48.	64.				
Magnesium	29.	28.				
Potassium	26.	22.				
Chloride	27.	17.				



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LABORATORY NO 81030-c

parts per million (mg/L)

	<u>154</u>	<u>155</u>	<u>156</u>	<u>157</u>	<u>158</u>	<u>159</u>
Sulfate as SO ₄	9.	4.				
Nitrate + Nitrite	L/0.05	L/0.05				
Total Phenol	L/0.005	0.12				
	<u>160</u>	<u>161</u>	<u>162</u>	<u>163</u>	<u>164</u>	<u>167</u>
Total Alkalinity as CaCO ₃			220.	22.	65.	
Sodium			22.	26.	14.	
Calcium			48.	16.	27.	
Magnesium			24.	1.4	1.3	
Potassium			15.	13.	12.	
Chloride			18.	44.	22.	
Sulfate as SO ₄			22.	12.	6.	
Nitrate + Nitrite			0.18	0.07	0.20	
Total Phenol			L/0.005	---	---	

parts per billion (ug/L)

	<u>148</u>	<u>149</u>	<u>150</u>	<u>151</u>	<u>152</u>	<u>153</u>
Benzene			L/1.			
Toluene			1.1			
Xylenes			19.			
Pentachlorophenol			6250.			
Total PNAs as benzo(a) pyrene, corrected for naphthalene			25.3			



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LABORATORY NO 81030-c

parts per billion (ug/L)

	<u>154</u>	<u>155</u>	<u>156</u>	<u>157</u>	<u>158</u>	<u>159</u>
Benzene	L/1.	1.4				
Toluene	L/1.	L/1.				
Xylenes	L/1.	1.8				
Pentachlorophenol	L/10.	---				
Total PNAs as benzo(a) pyrene, corrected for naphthalene	12.2	42.5				
	<u>160</u>	<u>161</u>	<u>162</u>	<u>163</u>	<u>164</u>	<u>167</u>
Benzene			L/1.	L/1.	L/1.	
Toluene			L/1.	L/1.	L/1.	
Xylenes			L/1.	L/1.	L/1.	
Pentachlorophenol			L/10.	---	---	
Total PNAs as benzo(a) pyrene, corrected for naphthalene			7.0	319.	163.	

Key

L/ indicates "less than"

cc Paul Farenthold
Woodward Clyde Consultants

Respectfully submitted,

Laucks Testing Laboratories, Inc.

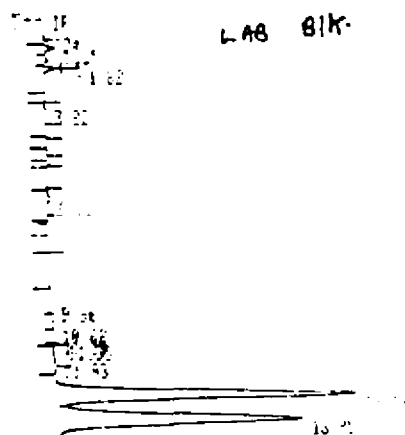
Mike Nelson

MN:bg

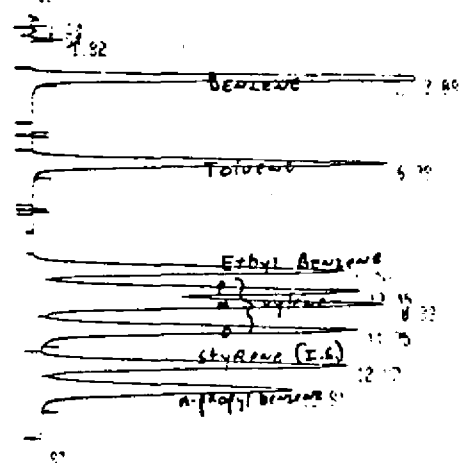


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SETA



HIT 21 4 e



OF

RUN 89

JUN/17/83 15:16:12

IN 8 86

JUN/17/83 15:16:12

RT	AREA	TYPE	CHL	AMOUNT
1.14	12684	FE		0.000
1.54	14259	BE		0.000
1.82	14730	BE		0.000
3.06	3463700	FE	1R	80.000
6.85	1829300	FE	2R	41.000
9.26	1590900	FE	3R	40.000
10.45	963360	DE	4R	42.000
10.83	1093100	FE	5R	46.000
11.75	1870200	BE	6R	44.000
12.97	1689700	FE	7L	42.000
13.81	1645800	BB	8R	40.000

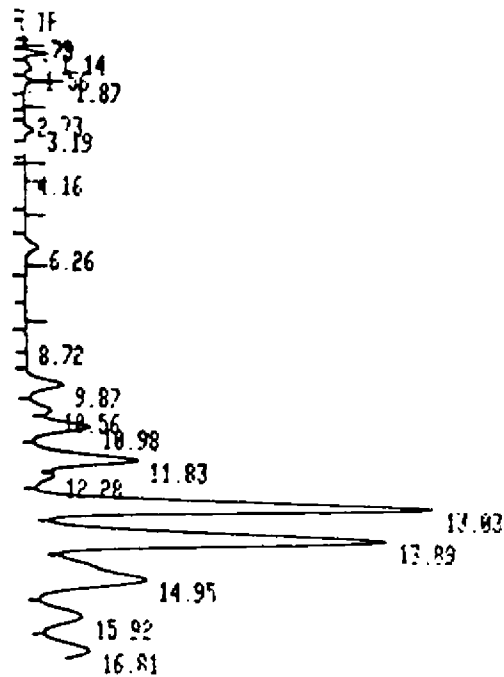
ISTD

RT	AREA	TYPE	CHL	AMOUNT
1.14	12684	FE		0.000
1.54	14259	BE		0.000
1.82	14730	BE		0.000
3.06	3463700	FE	1R	80.000
6.85	1829300	FE	2R	41.000
9.26	1590900	FE	3R	40.000
10.45	963360	DE	4R	42.000
10.83	1093100	FE	5R	46.000
11.75	1870200	BE	6R	44.000
12.97	1689700	FE	7L	42.000
13.81	1645800	BB	8R	40.000

TOTAL AREA= 1.4196E+07
ISTD AMT= 4.2000E+01
MUL FACTOR= 1.0000E+00

81030-1500

Set A



93
81030-150

JUN/17/83 16:55:05

T	AREA	TYPE	CALC	AMOUNT
75	0	PB		0.000
79	84	BB		0.000
14	38512	BB		0.000
56	19981	BB		0.000
87	9941	D BB		0.000
73	2197	BB		0.000
19	22884	BB	1R	0.550
16	1913	BB		0.000
26	45829	PB	2R	1.066
72	2255	PB		0.000
87	136200	PB	3R	3.707
56	31957	BB	4R	1.426
98	198290	BB	5R	8.446
83	389180	BB	6R	9.343
28	16914	BB		0.000
83	1666500	BB	7R	42.000
89	1691400	BB	8R	41.747
95	690990	BB		0.000
92	229710	BB		0.000
81	242370	I BH		0.000

IL AREA= 5437100
STD AMT= 4.2000E+01
FACTOR= 1.0000E+00

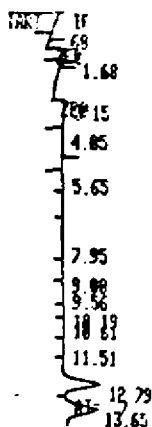
ID 81030-1542

A

ID 81030-1552

Multiply All values by 5

Attn. = 7 For
this Run
Attn = 4 For previous
runs.



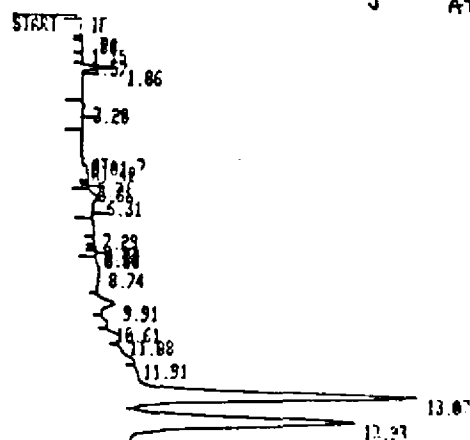
STOP

RUN # 97 JUN/17/83 18:38:25
ID 81030-154

RT	AREA	TYPE	CALC	AMOUNT
0.68	9176	BB		0.000
1.68	154600	BB		0.000
4.05	8356	BB		0.000
5.65	22665	BB		0.000
7.95	15511	PB		0.000
9.00	2953	BB		0.000
9.56	18693	BB		0.000
10.19	6549	BB		0.000
10.61	16569	BB	4R	0.010
11.51	13251	BB	6R	0.348
12.79	152100	BB	7L	42.000
13.65	1688000	1 8H	8R	45.621

TOTAL AREA= 3478200
ISTD AMT= 4.2000E+01
MUL FACTOR= 1.0000E+00

changed Att. to 4
At about 5 min

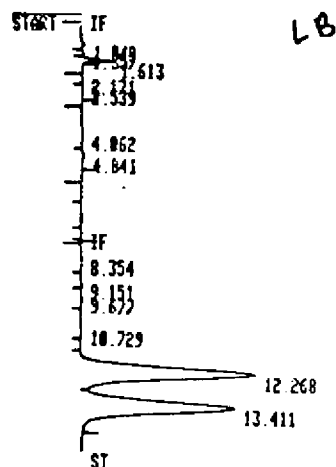
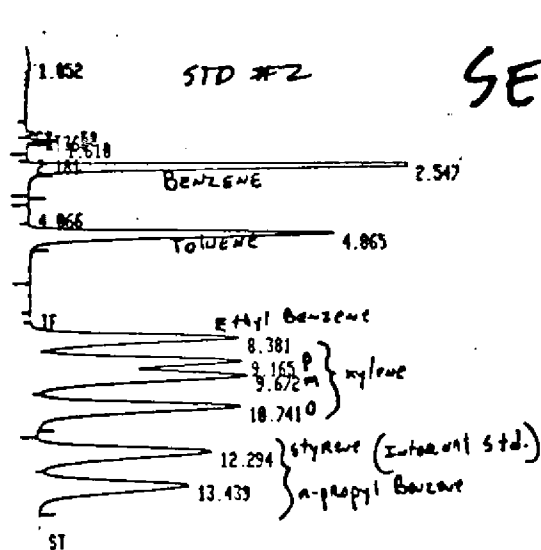


STOP

RUN # 98 JUN/17/83 18:59:58
ID 81030-155

RT	AREA	TYPE	CALC	AMOUNT
0.74	0	PB		0.000
0.80	539	BB		0.000
1.15	7690	BB		0.000
1.57	8743	BB		0.000
1.86	577820	BB		0.000
3.20	58305	BB	1R	1.365
5.71	83	PB		0.000
5.88	205	PB		0.000
6.31	43479	PB	2R	0.984
7.29	5092	PB		0.000
7.87	0	BB		0.000
7.99	543	BB		0.000
8.04	294	BB		0.000
8.08	308	BB		0.000
8.74	37973	BB		0.000
9.91	78127	BB	3R	2.071
10.61	9162	BB	4R	0.398
11.08	33913	BB	5R	1.406
11.91	0	BB	6R	0.000
13.07	1711500	BB	7L	42.000
13.93	1514800	BB	8R	36.405

TOTAL AREA= 4088600
ISTD AMT= 4.2000E+01
MUL FACTOR= 1.0000E+00



RUN # 5

RT	AREA	TYPE	CAL #	AMOUNT
0.888	0	PB		0.000
1.052	21244	BB		0.000
1.363	31482	BB		0.000
1.610	136290	BB		0.000
2.181	3136	BB		0.000
2.547	1.0640E+07	BB	1R	161.300
4.066	15068	BB		0.000
4.865	5737100	BB	2R	82.765
8.381	5368400	PH	3R	80.853
9.165	5716700	HH	4R	83.893
9.672	6683300	HH	5R	94.097
10.741	6418000	HH	6R	80.873
12.294	5947600	HH	7L	83.000
13.439	5486200	HH	8R	79.410

TOTAL AREA= 5.2205E+07
 ISTD AMT= 8.3000E+01
 MUL FACTOR= 1.0000E+00

RUN # 6

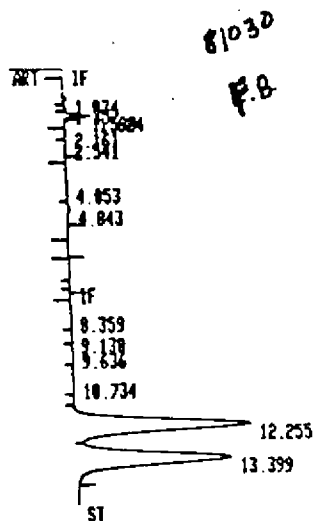
RT	AREA	TYPE	CAL #	AMOUNT
1.049	20251	PB		0.000
1.357	16763	BB		0.000
1.613	168930	BB		0.000
2.171	3557	BB		0.000
2.539	12535	BB	1R	0.191
4.062	33139	BB		0.000
4.841	40001	BB	2R	0.578
8.354	26404	HH	3R	0.398
9.151	27951	HH	4R	0.411
9.677	42398	HH	5R	0.507
10.729	59676	HH	6R	0.827
12.268	5910500	HH	7L	83.000
13.411	5595700	HH	8R	81.811

TOTAL AREA= 1.1950E+07
 ISTD AMT= 8.3000E+01
 MUL FACTOR= 1.0000E+00

RCALB #

ISTD CALIB RUNS 2
 REF 2 RTM: 3.00 2 RTM: 3.00

CAL #	RT	AMT	AMT/AREA
1R	2.51	1.6000E+02	1.5066E-05
2R	4.83	8.2000E+01	1.4129E-05
3R	8.35	8.0000E+01	1.4950E-05
4R	9.13	8.3000E+01	1.4566E-05
5R	9.64	9.3000E+01	1.3967E-05
6R	10.71	8.0000E+01	1.3748E-05
7L	12.26	8.3000E+01	1.3925E-05
8R	13.40	8.0000E+01	1.4498E-05



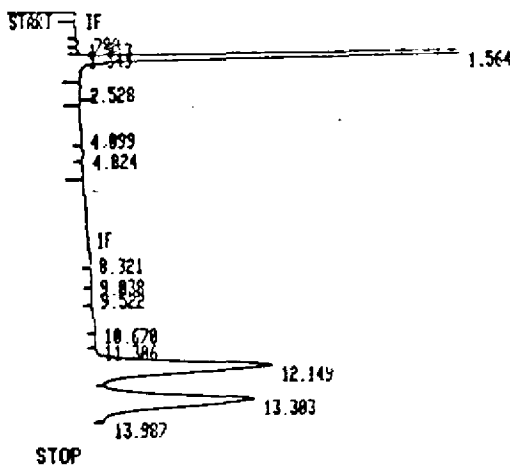
RUN # 7

RT	AREA	TYPE	CAL #	AMOUNT
1.834	14442	PB		0.000
1.357	16322	BB		0.000
1.590	0	BB		0.000
1.624	0	BB		0.000
2.161	12248	BB		0.000
2.541	9779	BB	1R	0.150
4.053	33681	BB		0.000
4.843	45045	BB	2R	0.650
8.359	21102	PH	3R	0.322
9.138	20943	HH	4R	0.311
9.636	33753	HH	5R	0.481
10.734	47160	HH	6R	0.661
12.255	5847000	HH	7L	83.000
13.399	5559100	HH	8R	82.160

TOTAL AREA= 1.1661E+07
 ISTD AMT= 8.3000E+01
 MUL FACTOR= 1.0000E+00

B

ID 81830-1620



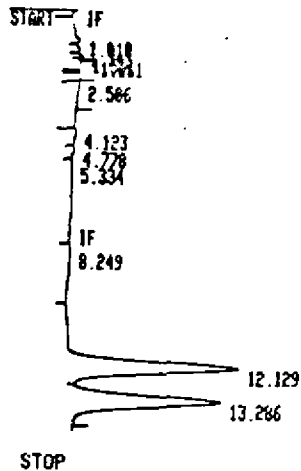
RUN # 20
ID 81830-162

RT	AREA	TYPE	CAL	AMOUNT
0.788	0	PB		0.000
1.013	18818	BB		0.000
1.349	9945	BB		0.000
1.564	1.2156E+07	BB		0.000
2.528	12481	BB	1R	0.175
4.099	13778	PB		0.000
4.824	33814	BB	2R	0.455
8.321	353450	HH	3R	4.962
9.038	214480	HH	4R	2.932
9.522	172890	HH	5R	2.267
10.670	367970	HH	6R	4.750
11.306	216670	HH		0.000
12.149	6347900	HH	7R	83.000
13.303	6079500	HH	8R	82.761
13.987	48887	0 HH		0.000

TOTAL AREA= 2.6037E+07
ISTD AMT= 8.3000E+01
MUL FACTOR= 1.0000E+00

B

ID 81030-1630

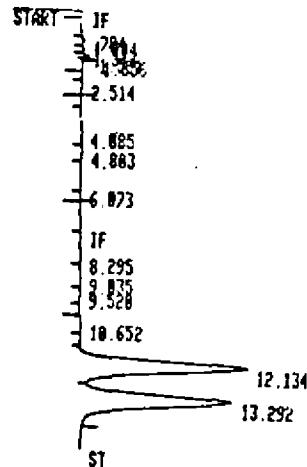


RUN # 21
ID 81030-163

RT	AREA	TYPE	CAL #	AMOUNT
1.010	10745	PB		0.000
1.343	18471	BB		0.000
1.561	13883	BB		0.000
1.661	17265	D BB		0.000
2.506	19570	BB	1R	0.289
4.123	32052	BB		0.000
4.778	24184	BB	2R	0.339
5.334	241850	BP		0.000
8.249	155188	PP	3R	0.272
12.129	6087100	PH	7L	83.000
13.286	5838500	HH	8R	82.085

TOTAL AREA= 1.2459E+07
ISTD AMT= 8.3000E+01
MUL FACTOR= 1.0000E+00

ID 81030-1640



RUN # 22
ID 81030-164

RT	AREA	TYPE	CAL #	AMOUNT
0.784	0	PB		0.000
1.004	21967	BB		0.300
1.343	16483	BB		0.600
1.561	27103	BB		0.000
1.656	14279	D BB		0.000
2.514	10901	PB	1R	0.175
4.085	25954	PB		0.000
4.883	30145	BB	2R	0.460
6.873	2767	BB		0.000
8.295	24490	PH	3R	0.390
9.035	32576	HH	4R	0.585
9.520	25864	HH	5R	0.384
10.652	45514	HH	6R	0.666
12.134	5601400	HH	7L	83.000
13.292	5482200	HH	8R	84.576

TOTAL AREA= 1.1362E+07
ISTD AMT= 8.3000E+01
MUL FACTOR= 1.0000E+00